THE BATTLE AT GETTYSBURG: COMPETITION BETWEEN UTILIZATION AND REMEDIATION FOR A LIMITED GROUNDWATER RESOURCE

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In rapidly developing areas that must rely on limited aquifers for water supply, an increasingly common issue is the need to consider efficiency of water utilization in the design of groundwater remediation systems. Taneytown, located in the Gettysburg Section of the Birdsboro Basin of north central Maryland, is the site of a decades-long battle over management of a limited and threatened groundwater resource. In the mid-1980s, groundwater monitoring by the Maryland Department of Environment (MDE) discovered tetrachloroethylene (PCE) in 2 of the city's 6 water supply wells. MDE identified potential sources of PCE near two city wells (MW-13 and MW-10, which are located approximately 2000' apart). MW-10 was decommissioned because PCE concentrations were above the maximum contaminant level (MCL), but PCE concentrations in MW-13 remained below MCL until 2003.

A manufacturer identified by MDE as having a possible source of PCE near well MW-13 conducted a comprehensive investigation of the area. Three significant saturated bedrock zones were identified at the site: a shallow zone (< 50 ft. deep) containing most of the PCE; an intermediate zone (150-200 ft. deep), which contains PCE and is the main water storage zone; and a deep zone (350-500 ft. deep), which is the water production zone for MW-13. The zones are hydraulically connected, with leaky discharge from the shallow to the intermediate zone. Most of the PCE plume occurs near a potential source approximately 400 ft. from MW-13.

Models indicated that the city's pumping rate for MW-13 would have to be reduced in order to use a recovery/injection system to capture and treat the PCE plume. The city initially rejected the proposed reduction, but MDE mediated a cooperative agreement. The implemented remedial plan combines activated carbon treatment at the wellhead with a separate recovery/injection system to contain the plume and reduce PCE levels. During its first 6 months of operation, the plume has been contained and PCE levels in MW-13 have fallen below MCL. The ongoing challenge will be to manage the MW-13 pumping rate during seasonal groundwater fluctuations so that the City's water needs are met while the recovery/injection system remains effective. Ongoing monitoring of the production and recovery wells capture zones is being used to manage the aquifer yield.

(A) Site Location: Taneytown, MD

(B) Overview of the Site Geology

Gettysburg Section of the Birdsboro Basin (Fail, 2005)

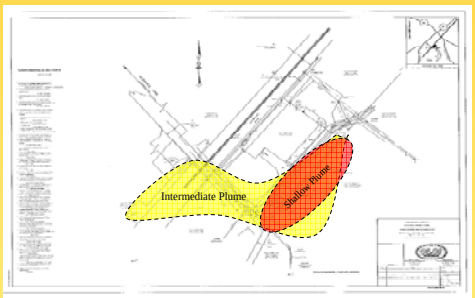
Triassic sedimentary rocks deposited in a rift zone.

New Oxford Formation; interbedded red shales, mudstones and sandstones.

Sandstones are aquifers, shales and mudstones are aquitards.

(C) Tetrachloroethyene (PCE) were found in samples from Municipal well 13 (MW-13). Plumes from possible industrial source, as delineated below.

Configuration of Plumes



(D) Hydrogeology of the Site

Three distinct saturated zones
- Shallow zone >50'
- Intermediate zone ~150-200'
- Deep zone ~350-500'

PCE is highest in the Shallow Zone

PCE is most mobile in the Intermediate Zone

Leakage occurs from the Shallow to the Intermediate zone

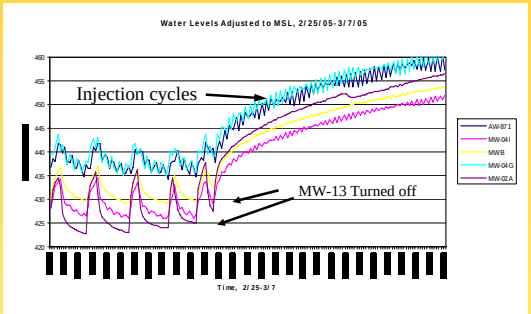
Storage capacity is greatest in the intermediate zone

Greater flow rates in the deep zone

The City well (MW-13) intake is in the deep zone

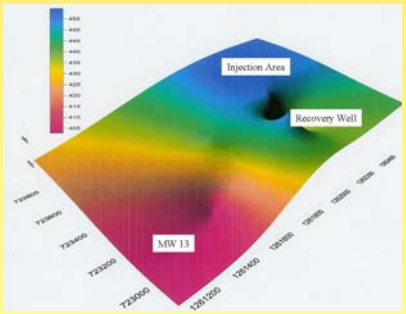
(E) A groundwater recovery and treatment system using air stripping. and carbon adsorption was constructed. Treated groundwater is re-injected. The system was designed to create a capture zone within the MW-13 capture zone.

(F) MW-13 pumping dominates flow in the area of the plume. The graph below shows the effect of MW-13 on Intermediate Zone wells

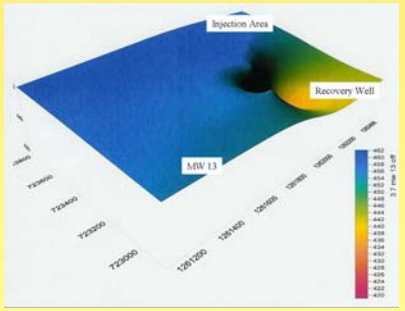


(G) Evaluations of the remedial systems capture zone, with and without MW-13 operating.

February 27: Intermediate Water Level, Remedial System Operating, MW-13 On



March 7: Intermediate Water Level, Remedial System Operating, MW-13 Down Long-term



(H) Results of Remedial System Operation: Intermediate Zone- Decrease in PCE concentrations in 3 months